DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name:	former York Naval Ordnance Plant
Facility Address:	1425 Eden Rd, York PA 17402
Facility EPA ID #:	PAD001643691

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X__ If yes - check here and continue with #2 below.

_____ If no – re-evaluate existing data, or

_____ If data are not available skip to #8 and enter "IN" (more information needed) status code

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Controls" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program, the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be "contaminated"[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action anywhere at, or from, the facility?

X	If yes – continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.
_____	If no – skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."
_____	If unknown (for any media)– skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Groundwater is contaminated with chlorinated volatile organics trichloroethene (TCE) and tetrachloroethene (PCE) and their degradation products (dichloroethenes (DCE) and vinyl chloride) beneath most of the facility, and lesser amounts of petroleum constituents benzene, trimethylbenzenes (TMB), and naphthalene beneath a well-defined area north of former Building 2. Recent sampling results (2017) show concentrations of primary contaminant TCE in a few wells within the most-impacted area of the facility exceeding the MCL of 5 ug/L by less than three orders of magnitude.

Reference: Groundwater Extraction and Treatment System 2017 Annual Operations Report, prepared by Hydro-Terra Group, March 2018.
Comprehensive Groundwater Monitoring Report for 2016-2017, prepared by Groundwater Sciences Corporation, August 2018.

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2])

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

For Part 2 of the supplemental groundwater RI, additional wells were installed and sampled over an approximately 4-year period to determine the vertical and lateral extent of contamination. The off-site plume to the south of the facility was also delineated with additional wells and sampling, and the groundwater extraction system was extended to the southeast corner of the facility in 2018 to ensure contamination did not migrate beneath residential development downgradient of the facility at concentrations that could present potential vapor intrusion risk. Natural attenuation has been demonstrated to be occurring in some areas beneath the facility, particularly at depth where solution cavities become less frequent and anaerobic conditions predominate. A shale formation running along the west side of Codorus Creek was confirmed to act as a barrier to contaminant migration further west. Based on these conditions and groundwater sampling information to date, the contaminant plume is not expected to migrate beyond its present footprint.

Reference: Supplemental Remedial Investigation Groundwater Report (Part 2), prepared by Groundwater Sciences Corporation, August 2016, revised March 2018.
Southern Property Boundary/South Plume Areas Supplemental Remedial Investigation and Interim Groundwater Remediation Report, prepared by Groundwater Sciences Corporation, November 2018.

[2] "Existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

X	If yes - continue after identifying potentially affected surface water bodies.
	If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.
	If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Contaminated groundwater discharges into Codorus Creek, located approximately 600 feet west of the facility boundary.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

X If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate "level(s)," and if estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing. .

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Under the currently operating groundwater extraction system that was restarted in January 2015 (with extraction wells CW-9, CW-13, CW-15A, CW-17, and CW-20 active), concentrations of all chlorinated volatile organics have been below Pennsylvania's Water Quality Criteria at all seven surface water monitoring locations.Some evidence exists that significant storm events may overwhelm the groundwater extraction system and lead to a spikein groundwater contaminant concentrations being discharged to surface water. However, it is anticipated that storms significant enough to overwhelm the groundwater extraction system are relatively rare and of a short duration resulting in a brief discharge of elevated contaminant concentrations that are likely to be quickly diluted in the higher and more turbulent flow of Codorus Creek immediately after a significant storm therefore, even under these circumstances, discharge of contaminated groundwater into surface water is likely to be insignificant.

Reference: Supplemental Remedial Investigation Groundwater Report (Part 2), prepared by Groundwater Sciences Corporation, August 2016, revised March 2018.

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be **"currently acceptable"** (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be **"currently acceptable")** – skip to #8 and enter a "NO" status, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems..

_____ If unknown – skip to 8 and enter "IN" status code.

Rationale and Reference(s):

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

X	If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."
_____	If no - enter "NO" status code in #8.
_____	If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

The annual groundwater sampling program (key well sampling) will continue in a modified form based on the results from the completed characterization phase (i.e., primarily facility perimeter and contaminant plume perimeter wells will continue to be sampled to confirm contaminant plume stability), and periodic sampling of surface water at established stations will also continue to ensure surface water standards are being met.

Reference: Supplemental Remedial Investigation Groundwater Report (Part 2), prepared by Groundwater Sciences Corporation, August 2016, revised March 2018.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

X YE - Yes, "Migration of contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the former York Naval Ordnance Plant facility, EPA ID # PAD001643691 located at 1425 Eden Rd, York, PA 17402. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater". This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Completed by: (signature) _____ Date 9-4-19

(print) Griff Miller

(title) Remedial Project Manager

Supervisor: (signature) _____ Date 9-6-19

(print) Paul Gotthold

(title) Chief, Corrective Action Branch 2

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Locations where References may be found:

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